

What is claimed is:

1 1. A video data transmission/reception system comprising a  
2 transmission-side apparatus and a plurality of reception  
3 terminals, the transmission-side apparatus transmitting video  
4 data that has been compressed using motion compensation  
5 interframe prediction, and the reception terminals receiving  
6 the video data and decoding the received video data, wherein  
7 the transmission-side apparatus includes:  
8 a first encoding unit operable to apply intraframe  
9 encoding processing or interframe encoding processing to each  
10 of a plurality of frames of moving image data, to generate the  
11 video data;  
12 a second encoding unit operable to apply, in parallel with  
13 the encoding processing by the first encoding unit, intraframe  
14 encoding processing to a frame of the moving image data, to  
15 generate substitute I frame data; and  
16 a transmission unit operable to transmit the video data  
17 and the substitute I frame data to the plurality of reception  
18 terminals,  
19 wherein when the transmission unit is to resume  
20 transmission of the video data to one of the reception terminals  
21 after temporarily interrupting transmission of the video data  
22 to the reception terminal, the transmission unit transmits at

23 least one frame's worth of the substitute I frame data to the  
24 reception terminal before resuming transmission of the video  
25 data, and

26 the reception terminal, when the transmission unit is to  
27 resume the temporarily interrupted transmission of the video  
28 data, receives the transmitted substitute I frame data, decodes  
29 the received substitute I frame data, and uses the decoded  
30 substitute I frame data as reference frame data to decode video  
31 data that is received after resumption of transmission.

1 2. A video data transmission apparatus that transmits video data  
2 that has been compressed using motion compensation interframe  
3 prediction to a plurality of reception terminals, comprising:

4 a first encoding unit operable to apply intraframe  
5 encoding processing or interframe encoding processing to each  
6 of a plurality of frames of moving image data, to generate the  
7 video data;

8 a second encoding unit operable to apply, in parallel with  
9 the encoding processing by the first encoding unit, intraframe  
10 encoding processing to a frame of the moving image data, to  
11 generate substitute I frame data; and

12 a transmission unit a transmission unit operable to  
13 transmit the video data and the substitute I frame data to the  
14 plurality of reception terminals, and when the transmission

15 unit is to resume transmission of the video data to one of the  
16 reception terminals after temporarily interrupting  
17 transmission of the video data to the reception terminal, the  
18 transmission unit transmits at least one frame's worth of the  
19 substitute I frame data to the reception terminal before  
20 resuming transmission of the video data.

1 3. The video data transmission apparatus of Claim 2, further  
2 comprising:

3 an option data transmission unit operable to transmit  
4 option video data to the reception terminal, in parallel with  
5 the transmission of the video data,

6 wherein the interruption of video data transmission to  
7 the reception terminal is caused by the transmission of the  
8 option video data.

1 4. The video data transmission apparatus of Claim 3, wherein

2 the option data transmission unit

3 includes an information collection sub-unit operable to  
4 collect, from each of one or more of the reception terminals,  
5 information about preferences of a user of the reception  
6 terminal, and

7 based on the collected information, selects contents of  
8 option data to be transmitted.

1 5. The video data transmission apparatus of Claim 3, wherein  
2 the transmission unit  
3 includes  
4 a broadcast transmission sub-unit operable to  
5 broadcast a same data to a plurality of transmission  
6 destinations; and  
7 an individual transmission sub-unit operable to  
8 transmit individual data to an individual transmission  
9 destination, and  
10 uses the broadcast transmission sub-unit to transmit the  
11 video data, and the individual transmission sub-unit to  
12 transmit the substitute I frame data, and  
13 the option data transmission unit transmits the option  
14 video data in an individual transmission manner.

1 6. The video data transmission apparatus of Claim 5, wherein  
2 the transmission unit includes  
3 a switch sub-unit operable to exempt a reception terminal  
4 to which substitute I frame data or option video data is being  
5 transmitted from being a target of transmission of the video  
6 data by the broadcast transmission sub-unit.

1 7. The video data transmission apparatus of Claim 3, wherein

2       the option data transmission unit includes  
3       an insertion sub-unit operable to transmit secondary  
4       option data part way through transmission of the option data;  
5       and

6       a third encoding sub-unit operable, after transmission  
7       of the secondary option data ends and before transmission of  
8       the option data resumes, to generate option data substitute I  
9       frame data that corresponds to at least one frame of the option  
10      data starting from a frame that is a first frame after  
11      transmission resumption,

12      wherein when transmission of the option data is to resume  
13      after the transmission of the secondary option data ends, the  
14      option data transmission unit transmits the option data  
15      substitute I frame data to the reception terminal before  
16      transmission of the option data resumes.

1      8. The video data transmission apparatus of Claim 2, wherein  
2       the first encoding unit and the second encoding unit are  
3       realized in separate encoders.

1      9. The video data transmission apparatus of Claim 2, wherein  
2       the transmission unit determines how many frames of  
3       substitute I frame data to transmit to the reception terminal  
4       before resuming transmission of the video data, based on a GOP

5 structure of the video data, and in particular, based on a  
6 frequency of appearance of frames having an I attribute or a  
7 P attribute.

1 10. A video data transmission apparatus that transmits video  
2 data that has been compressed using motion compensation  
3 interframe prediction to a plurality of reception terminals,  
4 comprising:

5 a first encoding unit operable to apply intraframe  
6 encoding processing to a frame of moving image data, to generate  
7 intraframe encoded video data;

8 a second encoding unit operable to apply interframe  
9 encoding processing to a frame of moving image data, to generate  
10 interframe encoded video data;

11 a video data generation unit operable to generate the  
12 video data from the intraframe encoded video data and the  
13 interframe encoded video data; and

14 a transmission unit operable to transmit the video data  
15 to the plurality of reception apparatuses,

16 wherein when the transmission unit is to resume  
17 transmission of the video data to one of the reception terminals  
18 after temporarily interrupting transmission of the video data  
19 to the reception terminal, the transmission unit transmits at  
20 least one frame's worth of the intraframe encoded video data

21 to the reception terminal as substitute I frame data before  
22 resuming transmission of the video data.

1 11. A video data transmission/reception system comprising a  
2 plurality of video data provision apparatuses, a plurality of  
3 reception terminals, and a distribution server, the video data  
4 provision apparatuses transmitting video data that has been  
5 compressed using motion compensation interframe prediction,  
6 each reception terminal receiving the video data from any one  
7 of the video data provision apparatuses and decoding the  
8 received video data, and the distribution server conveying the  
9 video data between the video data provision apparatuses and the  
10 reception terminals, wherein

11 each video data provision apparatus includes:

12 a first encoding unit operable to apply intraframe  
13 encoding processing or interframe encoding processing to each  
14 of a plurality of frames of moving image data, to generate the  
15 video data; and

16 a second encoding unit operable to apply, in parallel with  
17 the encoding processing by the first encoding unit, intraframe  
18 encoding processing to each of a plurality of frames of the  
19 moving image data, to generate substitute I frame data, and

20 the distribution server includes:

21 a switch request reception unit operable to receive a

22 request from one of the reception terminals to switch video data  
23 received by the reception terminal to different video data; and  
24 a switch transmission unit operable, on the switch  
25 request reception unit receiving the request, to stop  
26 transmission of the video data being transmitted to the  
27 request-originating user terminal, obtain substitute I frame  
28 data from a video data provision apparatus that is to provide  
29 the different video data, transmit the obtained substitute I  
30 frame data to the user terminal, and transmit the different  
31 video data to the user terminal.

1 12. A distribution server in a video data  
2 transmission/reception system that further includes a  
3 plurality of video data provision apparatuses and a plurality  
4 of reception terminals, the video data provision apparatuses  
5 transmitting video data that has been compressed using motion  
6 compensation interframe prediction, each reception terminal  
7 receiving video data from any one of the video data provision  
8 apparatuses, and the distribution server conveying the video  
9 data between the video data provision apparatuses and the  
10 reception terminals, the distribution server comprising:

11 a switch request reception unit operable to receive a  
12 request from one of the reception terminals to switch video data  
13 received by the reception terminal to different video data; and

14           a switch transmission unit operable, on the switch  
15 request reception unit receiving the request, to stop  
16 transmission of the video data being transmitted to the  
17 request-originating user terminal, obtain substitute I frame  
18 data from a video data provision apparatus that is to provide  
19 the different video data, transmit the obtained substitute I  
20 frame data to the user terminal, and transmit the different  
21 video data to the user terminal.

1   13. A video data provision apparatus in a video data  
2 transmission/reception system that includes a plurality of  
3 video data provision apparatuses, a plurality of reception  
4 terminals, and a distribution server, the video data provision  
5 apparatuses transmitting video data that has been compressed  
6 using motion compensation interframe prediction, each  
7 reception terminal receiving video data from any one of the  
8 video data provision apparatuses, and the distribution server  
9 conveying the video data between the video data provision  
10 apparatuses and the reception terminals, the video data  
11 provision apparatus comprising:

12           a first encoding unit operable to apply intraframe  
13 encoding processing or interframe encoding processing to each  
14 of a plurality of frames of moving image data, to generate the  
15 video data;

16           a second encoding unit operable to apply, in parallel with  
17 the encoding processing by the first encoding unit, intraframe  
18 encoding processing to each of a plurality of frames of the  
19 moving image data, to generate substitute I frame data; and  
20           a transmission unit operable to transmit the video data  
21 to the distribution server, and, when one of the reception  
22 terminals requests to switch video data being received to the  
23 video data being transmitted by the transmission unit, transmit  
24 at least one frame of substitute I frame data to the reception  
25 terminal via the distribution server, before the switch.

1   14. An encoder that compresses moving image data using motion  
2 compensation interframe prediction, comprising:

3           a first encoding unit operable to apply intraframe  
4 encoding processing or interframe encoding processing to each  
5 of a plurality of frames of moving image data, to generate the  
6 video data; and

7           a second encoding unit operable to apply, in parallel with  
8 the encoding processing by the first encoding unit, intraframe  
9 encoding processing to each of a plurality of frames of the  
10 moving image data, to generate substitute I frame data.

1   15. An encoder that compresses moving image data using motion  
2 compensation interframe prediction, comprising:

3       a first encoding unit operable to apply intraframe  
4       encoding processing to a frame of moving image data, to generate  
5       intraframe encoded video data;

6       a second encoding unit operable to apply interframe  
7       encoding processing to a frame of moving image data, to generate  
8       interframe encoded video data;

9       an encoded video data generation unit operable to  
10      generate encoded video data from the intraframe encoded video  
11      data and the interframe encoded video data; and

12      a substitute data generation unit operable to generate  
13      substitute I frame data from the intraframe encoded video data.

1   16. A video data transmission/reception method used by a  
2   transmission-side apparatus and one of a plurality of reception  
3   terminals in a video data transmission/reception system in  
4   which the transmission-side apparatus that transmits video data  
5   that has been compressed using motion compensation interframe  
6   prediction, and the plurality of reception terminals receive  
7   the video data and decode the received video data, the method  
8   comprising:

9       a first encoding step, in the transmission-side apparatus,  
10      of applying intraframe encoding processing or interframe  
11      encoding processing to each of a plurality of frames of moving  
12      image data, to generate the video data;

13           a second encoding step, in the transmission-side  
14 apparatus, of applying, in parallel with the first encoding step,  
15 intraframe encoding processing to each of a plurality of frames  
16 of the moving image data, to generate substitute I frame data;  
17           a video data transmission step, in the transmission-side  
18 apparatus, of transmitting the video data to a reception-side  
19 apparatus;  
20           a transmission interruption step, in the  
21 transmission-side apparatus, of interrupting transmission of  
22 the video data to the reception-side apparatus;  
23           a substitute data transmission step, in the  
24 transmission-side apparatus, of transmitting at least one  
25 frame's worth of the substitute I frame data to the reception  
26 terminal;  
27           a substitute data decoding step, in the reception  
28 terminal, of decoding the substitute I frame data;  
29           a video data retransmission step, in the transmission  
30 side apparatus, of resuming transmission of the video data to  
31 the reception terminal; and  
32           a video data decoding step, in the reception terminal,  
33 of decoding the video data received after resumption of  
34 transmission, using data obtained as a result of executing the  
35 substitute data decoding step, as reference frame data.

1 17. A program for having executed in a computer a video data  
2 transmission method used by a transmission-side apparatus in  
3 a video data transmission/reception system in which the  
4 transmission-side apparatus that transmits video data that has  
5 been compressed using motion compensation interframe  
6 prediction, and a plurality of reception terminals receive the  
7 video data and decode the received video data, the method  
8 comprising:

9       a first encoding step of applying intraframe encoding  
10 processing or interframe encoding processing to each of a  
11 plurality of frames of moving image data, to generate the video  
12 data;

13       a second encoding step of applying, in parallel with the  
14 first encoding step, intraframe encoding processing to each of  
15 a plurality of frames of the moving image data, to generate  
16 substitute I frame data;

17       a video data transmission step of transmitting the video  
18 data to a reception-side apparatus;

19       a transmission interruption step of interrupting  
20 transmission of the video data to the reception-side apparatus;

21       a substitute data transmission step of transmitting at  
22 least one frame's worth of the substitute I frame data to the  
23 reception terminal; and

24       a video data retransmission step of resuming transmission

25 of the video data to the reception terminal.